POSIZIONING DEVICE, ESPECIALLY FOR OFFSET PLATES

The invention relates on the one hand to a device for positioning an element with respect to at least two reference points, and on the other hand to a device for positioning an offset plate on a positioning table of a pre-press equipment, comprising means to move the offset plate in a plane parallel to the positioning table to at least one reference point on the positioning table.

Until now, different devices are known for positioning an element with respect to at least two reference points.

In U.S. 4,425,076, a process and apparatus is known for automatically positioning a piece on a worktable. A worktable supports a reference system constituted by three rollers. The piece such as a substrate is placed on the table in the neighborhood of the rollers. A first pivoting arm comes into contact with a side of the substrate to bring the opposed side in contact with the rollers. A second pivoting arm comes into contact with the side of the substrate to bring the opposed side in contact with the rollers. The arms are controlled by a single means such as a jack of which the body and the rod are floatingly mounted and are respectively associated with the two arms. The invention is primarily useful for positioning of a support for integrated circuits in a serigraphic machine.

In WO 8 607 232, a placement apparatus for positioning and securing a circuit panel on a work surface includes two gripping or engaging devices to engage two diagonally opposite corners of the panel and a mechanism for moving the engaging devices substantially in line with a diagonal line of the panel and apply pressure thereto to position the center point of the panel and coordinate axes originating

thereat in registration with a center point and reference coordinate axes of the work surface.

For the positioning of at least one offset plate on a positioning table of a pre-press equipment, devices are known in which the offset plates are put on the positioning table by means of a loader in the vicinity of three roller shaped reference points. The offset plate is positioned with respect to these three rollers by means of three fingers which are placed facing the rollers and which push the offset plate against these rollers. Once there is contact between the offset plate and the three rollers, the plate is positioned and the plate is kept in its correct position by means of vacuum channels.

This device has the disadvantage that different fingers are necessary to position offset plates with different sizes. The positioning system is in that way dependent on the size of the offset plates. A further disadvantage is that different means are necessary to perform the different movements to the reference points.

The disadvantage of all known devices is that for each size of the element to be positioned a different positioning table is necessary. A further disadvantage is that different moving elements are provided for the performing of different movements.

The purpose of the invention is on the one hand to provide in a device for positioning an element with respect to at least two reference points, which doesn't show the abovementioned disadvantages.

This purpose is achieved by providing in a device for positioning an element with respect to at least two reference points, in which said device acts upon a working point on the element to be positioned and comprises a positioning arm attached to a fixed hinging point with respect to said reference points, comprising two mutually hinged parts allowing a movement of said element to each reference point.

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This has the advantage that the size of the element to be positioned doesn't matter through which the device can be used for the positioning of different kinds of elements. A further advantage is that the same means, i.e. the positioning arm, is used for performing the movement to the different reference points.

In a preferred embodiment of a device according to the invention, the positioning arm comprises a vacuum sucking element to make contact with the offset plate.

In a more preferred embodiment of a device according to the invention, between the two mutually hinged parts a spring is provided to bring the parts back into their original position after the positioning of the offset plate.

In a specific embodiment of a device according the invention, said positioning arm comprises a double working cylinder to perform the movement of the positioning arm.

In a more specific embodiment of a device according the invention, the positioning arm comprises a second cylinder and a suction cup provided an up and down movement of the suction cup.

A further purpose of the invention is to provide in a device for positioning an offset plate on a positioning table of a pre-press equipment which doesn't show the abovementioned disadvantages.

This purpose is achieved by providing in a device for positioning a offset plate on a positioning table of an offset printing equipment, comprising means to move the offset plate in a plane parallel to the positioning table to at least one reference point on the positioning table, in which said means act upon a working point situated in the supporting plane of the offset plate on the positioning table.

This has the advantage that offset plates with different sizes can be positioned by the same device and for the performing of the movement of the offset plate to each reference point the same means, i.e. a positioning arm, is provided.

In a preferred embodiment of a device according to the invention, said means act upon said working point through an aperture in the positioning table.

This has the advantage that the processing time of the positioning device can be shortened when it is compared with the processing time which is necessary in a positioning system which is attached to the loader. In the device according to the invention, the positioning can be performed while the positioning table is moved to the place where the offset plate is illuminated.

In a specific embodiment of a device according to the invention, at least two reference points are situated on the positioning table and said means comprise a positioning arm which is attached to a fixed hinging point with respect to said reference point, comprising two mutually hinged parts allowing a movement of said element to each reference point.

In a more specific embodiment of a device according to the invention, the positioning arm comprises a vacuum sucking element to make contact with the element.

In a further more specific embodiment of a device according to the invention, between the two mutually hinged parts a spring is provided to bring the hinged parts back into their original position after the positioning of the element.

In a preferred embodiment of a device according to the invention, said positioning arm comprises a double working cylinder to perform the movement of the positioning arm.

In a more preferred embodiment of a device according to the invention, the positioning arm comprises a suction cup and a second cylinder which provides for an up and down movement of the suction cup.

Preferably, in a device according to the invention the positioning table is provided with two positioning arms to position two offset plates at the same time or to position offset plates with greater size on the positioning table.

This has the advantage that the both positioning arms can be used to push the offset plate against the reference points.

In order to explain the properties of this invention further and in order to specify additional advantages and distinctive features thereof, there now follows a more detailed specification of a device for positioning an element with respect to at least two reference points implemented according to this invention. More specific, a device for positioning at least one offset plate on a positioning table of a pre-press equipment will be described. It is clear that nothing in the following specification may be interpreted as a restriction on the protection claimed for this invention in the claims.

This invention will be explained on the basis of figures, whereby

- ***figures 1a to 1c*** are figures to explain the principle of the positioning arm;
- ***figure 2*** is a cross-sectional view of a positioning arm which is arm attached to the positioning table;
- ***figure 3*** is a perspective view of the positioning arm as shown in figure 2;

The device (1) for positioning at least one offset plate (2) on a positioning table (3) of a pre-press equipment, as shown in figures 1a to 1c, comprises a loading device (not shown in the figures) which picks up the offset plate out of a cassette or a trolley, and puts the picked up offset plates on a positioning table (3). Thereafter, the offset plates are illuminated with a laser (not shown on the figure). After this illumination

process, the offset plate (2) is transported to a online offset plate processor by means of a unloading system (not shown on the figure).

Figures 1a, 1b and 1c show the principle for positioning the offset plate (2) on the positioning table (3).

On the positioning table (3), three roller shaped reference points (4a, 4b, 4c) (hereafter called rollers) are provided. Further, a positioning arm (5) is provided to move the offset plate against the rollers (4a, 4b, 4c). The positioning arm (5) consists of two mutually hinged parts, i.e. a first (6a) and a second hinged part (6b), allowing a movement of the offset plate (2) to each roller (4a, 4b, 4c). The first part (6a) of the positioning arm (5) is attached to a fixed hinging point (7) which is provided to the positioning table (3). The two hinged parts (6a, 6b) are mutually hinged to each other in a floating hinging point (8). The second part (6b) of the positioning arm (5) is provided with a vacuum sucking element (9) which can move in an aperture (20) (shown in figure 2 in the positioning table (3). In that way, the vacuum suction cup (9) can make contact with the offset plate (2). Between the two hinged parts (6a, 6b) a spring (10) is provided to bring the two second hinged part (6b) back into its original position after the positioning of the offset plate (2).

The offset plate (2) always have to be positioned against the three rollers (4a, 4b, 4c) with a small tolerance of some μm. After the loading of the offset plate (2) on the positioning table (3) in the vicinity of the rollers (4a, 4b, 4c), the positioning arm (5) has to suck the offset plate (2) by means of the vacuum sucking element (9) which can move in the aperture (20) in the positioning table (3). Thereafter, a force F is exerted on the positioning arm (5), as shown in figure 1b. Because of that, the positioning arm (5) will rotate around the fixed hinging point (7) and the offset plate (2) is pushed or dragged with force A against the first two rollers (4a, 4b). Once the offset plate (2) is positioned with respect to these two rollers (4a, 4b), the positioning arm (5) will rotate around the fixed hinging point (7), but also around the floating hinging point (8) through which the offset plate (2) is moved with force B in the Y-

direction. In that way, the spring (10) is stretched. Once the offset plate (3) is positioned against the third roller (4c), the positioning arm (5) blocks and stays in the same position. Thereafter, the offset plate (2) is sucked to the positioning table (3) by means of vacuum channels (not shown on the figure) through which it remains in its position. The suction cup (9) which moves the offset plate (2) is now placed in a vacuumless position and the positioning arm (5) is moved back to its original position (as shown in figure 1a) by exorting force F in the other direction.

By using this principle, two movements (A, B) in two different directions are performed through the same means, i.e. the positioning arm (5). Furthermore, the suction cup (9) acts upon a working point situated in the supporting plane of the offset plate on the positioning table (3). The offset plate (2) is accordingly not moved through sidewardly pushing, but is moved through sucking the underside of the offset plate (2) and moving it to the correct position by means of the positioning arm (5).

The movement of the positioning arm (5) (shown in detail in figures 2 and 3) is performed through a double working cylinder (11). While the offset plate (2) is positioned, the cylinder (11) is retracted through which the positioning arm (5) can rotate around the hinging points (7, 8). After the positioning, the cylinder is pushed outwardly while the spring (not shown on the figures 2 and 3) brings the hinged parts (6a, 6b) back into their original position, in which a hook of 90° is formed between the hinged parts (6a, 6b). The double working cylinder (11) is hinged attached, at one end by means of the coupling piece (12) and at the other end through a rod eye (not visible on the figure).

The positioning arm (5) is further provided with a second cylinder (13) which provides for the up and down movement of the suction cap (9). The suction cap (9) is coupled to the rod of the second cylinder (13) by means of a vacuum coupling piece (14). In this way, vacuum can be connected to the suction cap (9). After placing the offset plate (2) in the vicinity of the rollers, the second cylinder (13) pushes up the suction cap (9), whereafter the suction cap is sucked vacuum and the

offset plate (2) is pushed against the rollers (4a, 4b, 4c). Subsequently, vacuum channels in the positioning table (3) provide that the offset plate (2) stays in its correct position. Thereafter, the suction cap (9) is put in a vacuumless condition and the second cylinder (13) moves again downwards so as to be situated under the surface of the positioning table (3).

The freedom of movement of the positioning arm (5) is limited because of a bearing holder (15) which can move in a stop block (16). These two elements determine the maximum movement space of the offset plate (2) in the X- and Y-direction and provide that the hook between the two hinged parts (6a, 6b) can not be smaller than 90°.

The fixed hinging point (7) is formed through two ball bearings (17), a fastening bolt (18), a bearing house (19) and a fastening ring (21). The fastening bolt (18) is screwed in in the underside of the positioning table (3).

The floating hinging point (8) is formed through two ball bearings (22), a fastening bolt (23), a coupling ring (24), a bearing house (25), an intermediate ring (26) and a self-locking nut (27).

Normally, two positioning arms (5) are provided on the positioning table (3) as to illuminate two offset plates (2) at the same time. If offset plates (2) with a greater size have to illuminated, there is only space for one offset plate (2) on the positioning table (3). To position such offset plates (2), both positioning arms (5) can be used to push the offset plate (2) against the rollers (4a, 4b and 4c).

CLAIMS

1. Device for positioning an element (2) with respect to at least two reference points (4a, 4c), **characterised in that** said device (1) acts upon a working point on the element (2) to be positioned and comprises a positioning arm (5) attached to a fixed hinging point (7) with respect to said reference points (4a, 4c), comprising two mutually hinged parts (6a, 6b) allowing a movement of said element (2) to each reference point (4a, 4c).

2. Device according to claim 1, **characterised in that** the positioning arm (5) comprises a vacuum sucking element (9) to make contact with the element (2).

3. Device according to claim 1 or 2, **characterised in that** between the two mutually hinged parts (6a, 6b) a spring (10) is provided to bring the second hinged part (6b) back into its original position after the positioning of the element (2).

4. Device according to any one of claims 1 to 3, **characterised in that** said positioning arm (5) comprises a double working cylinder 11) to perform the movement of the positioning arm (5).

5. Device according to any one of claims 1 to 4, **characterised in that** the positioning arm (5) comprises a suction cup (9) and a second cylinder (13) which provides for an up and down movement of the suction cup (9).

6. Device for positioning at least one offset plate (2) on a positioning table (3) of a pre-press equipment, comprising means (5) to move the offset plate (2) in a plane parallel to the positioning table (3) to at least one reference point (4a) on the positioning table (3), **characterised in that** said means (5) act upon a working point situated in the supporting plane of the offset plate (2) on the positioning table (3).

7. Device according to claim 6, **characterised in that** said means (5) act upon said working point through an aperture (20) in the positioning table (3).

8. Device according to claim 6 or 7, **characterised in that** at least two reference points (4a, 4c) are situated on the positioning table (3) and **that** said means comprise a positioning arm (5) which is attached to a fixed hinging point (7) with respect to said reference points (4a, 4b), comprising two mutually hinged parts (6a, 6b) allowing a movement of said element (2) to each reference point (4a, 4c).

9. Device according any one of claims 6 to 8, **characterised in that** Device according to claim 1, **characterised in that** the positioning arm (5) comprises a vacuum sucking element (9) to make contact with the offset plate (2).

10. Device according any one of claims 6 to 9, **characterised in that** between the two mutually hinged parts (6a, 6b) a spring (10) is provided to bring the second hinged part (6b) back into their original position after the positioning of the offset plate (2).

11. Device according to any one of claims 6 to 10, **characterised in that** said positioning arm (5) comprises a double working cylinder (11) to perform the movement of the positioning arm (5).

12. Device according to any one of claims 6 to 11, **characterised in that** the positioning arm (5) comprises a suction cup (9) and a second cylinder (13) which provides for an up and down movement of the suction cup (9).

13. Device according to any one of claims 6 to 12, **characterised in that** the positioning table (3) is provided with two positioning arms (5) to position two offset plates (2) at the same time or to position offset plates (2) with greater size on the positioning table (3).